DESIGN OPTIMIZATION OF A SUPERBIKE PADDOCK STAND THROUGH INTEGRATED CAD AND CAE SYSTEM APPLICATION

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JUNE 2013

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Surat Kami : 600-RMI/ST/DANA 5/3/Dst (148/2011)
Tarikh : 23 Mei 2011

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KELULUSAN PERMOHONAN DANA KECEMERLANGAN 05/2011

Tajuk Projek	:	Design Optimization Of A Superbike Paddock Stand Through Integrated CAD And CAE System Application
Kod Projek	:	600-RMI/ST/DANA 5/3/Dst (148/2011)
Kategori Projek	:	Kategori F (2011)
Tempoh	:	01 Jun 2011 – 31 Mei 2012 (12 bulan)
Jumlah Peruntukan	:	RM 6,000.00
Ketua Projek	:	En Helmi Rashid

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2. Sukacita dimaklumkan pihak Universiti telah meluluskan cadangan penyelidikan Y. Brs Profesor/tuan/puan untuk membiayai projek penyelidikan di bawah Dana Kecemerlangan UiTM.

3. Bagi pihak Universiti kami mengucapkan tahniah kepada Y. Brs. Profesor/tuan/puan kerana kejayaan ini dan seterusnya diharapkan berjaya menyiapkan projek ini dengan cemerlang.

4. Peruntukan kewangan akan disalurkan melalui tiga (3) peringkat berdasarkan kepada laporan kemajuan serta kewangan yang mencapai perbelanjaan lebih kurang 50% dari peruntukan yang diterima.

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Sekian, harap maklum.

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5. Report

5.1 Proposed Executive Summary

A normal design of a superbike paddock stand usually requires two people to lift up the superbike. This contributes to an impractical and inconvenient working scenario for riders when doing maintenance work alone. Therefore a newly designed superbike paddock stand was developed to overcome this problem whereby it managed to demonstrate a new working procedure to help riders to lift up their superbike alone.

However there are still rooms for improvements on this newly designed superbike paddock stand that can be optimized. Through this research, the optimizations are established through CAD and CAE system application.

The objectives of this research are to optimize a new design of a superbike paddock stand focusing on finite element analysis (FEA) on different size of steel tubing used and to develop a physical prototype for testing and verification purpose.

The initial stage of the research methodology is to put up a literature study on types of superbike paddock stand, working procedures of using paddock stands and also suitable materials in fabricating paddock stand. This will be followed by the development of a CAD model replicating the new designed paddock stand to be optimized.

A finite element model will be generated from the CAD model to be simulated and analysed using CAE application software. The results from this simulation and analysis will be used to develop a physical prototype for testing and verification purpose on an actual superbike.

Outcomes of this research may contribute to a new commercialised design of a superbike paddock stand and improve working procedures for riders that somehow need to do maintenance works alone.

5.2 Enhanced Executive Summary

Optimizing newly designed products makes the product much better and reliable when computer technologies are being used in reviewing the design. This goes the same to a newly designed superbike paddock stand that was previously designed to assist bikers to lift up their bikes alone for maintenance purpose.

This new designed superbike paddock stand was previously tested for its functionality and managed to prove its design concept that was found to be heavy and bulky in size which may lead to over design and higher cost of manufacturing. As a potential product that can penetrate the market of superbike users, design optimization is needed so that the product satisfy the customer demands that always drives the market for a particular new product

Therefore to optimize the design, state-of-the-art computer aided software CATIA V5R18 was extensively used to cater the aspect of Computer Aided Engineering (CAE) and Computer Aided Design (CAD) element in the project. By using these software, an optimized design can be developed with better outcomes and shorter design time.

Computer Aided Engineering (CAE) simulation was done upon the new optimized paddock stand design to determine its strength using Finite Element Analysis (FEA) in CATIA V5R18 software. The results shown that the Maximum Von Mises Stress for the maximum load tested that was 500kg does not exceeds the Maximum Yield Strength of the new material being introduced, Aluminum 6061 T6.

In parallel, a new prototype was fabricated using the new material of Aluminum 6061 T6; outer diameter (OD) = 38.1mm and thickness = 4.5mm, substituting the previous material used that was mild steel. This managed to reduce the weight of the stand by 25% of the previous paddock stand from approximately 6kg to only 4.5kg.

Finally the prototype was tested on a compression machine using a simplified jig to hold the paddock stand on the machine. The results obtained suits and validated the FEA results and concluded that a new optimized superbike paddock stand with a better weight, strength and portability has been developed.